USAWC STRATEGY RESEARCH PROJECT

THE CURRENT AND FUTURE FORCE: ACQUISITION STRATEGY AND STRUCTURE

by

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ABSTRACT

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This research paper will explore the acquisition strategy, process, and structure as necessary components to successfully transform the Army. The last major Army transformation was in the 1980s during the "Big 5" programs that implemented a platform centric acquisition approach. The Brigade Combat Team (BCT) program, started in 2000, concentrated on building a family of vehicles with off-the-shelf technology. The BCT program implemented innovative changes to their strategy for synergy and unity of effort that streamlined the acquisition process. The BCT changes are helping to mold and develop the Future Combat System (FCS) strategy. However, the Army's Future Force "system of systems" concept is a holistic environment that requires extensive integration and embedded advanced technology systems. The FCS is the materiel enabler to achieve transformation and is an aggregate of systems coming together and fielded as a "unit of action." This paper will evaluate the Current and Future Force acquisition strategy, process, and structure. I will analyze the pros and cons, identify challenges and present recommendations for change. If it is done right, Army Acquisition will break the stovepipe organizational and platform centric culture.

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THE CURRENT AND FUTURE FORCE: ACQUISTION STRATEGY AND STRUCTURE

INTRODUCTION

> The Army of 2004 adapted to a new era that required a different force; a new strategy, a new approach to war, and a different mindset for the future. Not only did the Department of Defense's strategy and processes need to change, the Army realized it had to Transform holistically to remain relevant and capable both in 2004 and to meet the challenges of the future.
>
> —Objective Force Task Force[1]

The Army's transformation into the Future Force requires state of the art technology. The introduction of advanced technology requires a transformation in acquisition that provides focus and unity of effort. The current acquisition structure does not foster unity of effort and efficiency in modernizing the Current Force while simultaneously developing the Future Force. Army acquisition strategy is evolving from a traditional, platform centric approach, to a family of vehicles approach, and on to a revolutionary family of systems approach. The research indicates that the acquisition community focused on transformation of the Future Force, but left the Current Force to muddle through transformation. Army Chief of Staff (CSA) General Schoomaker emphasized transforming the Current Force by spiraling advanced technology slated for the Future Force.[2] This strategy could cause ineffectiveness and inefficiencies in both Future and Current Force programs. There has been a significant change in philosophy exemplified by the Future Combat System (FCS) family of systems approach, however, the overall Army acquisition strategy and structure hinders and suppresses synergism for rapid and efficient changes in the Current and Future Force. Building unity of effort will require organizational changes to the Program Executive Office (PEO) structure.

The traditional approach effectively countered the Soviet threat and doctrine. Program managers built these programs along parochial lines with stovepipe organizations. The Stryker Brigade Combat Team (SBCT) program, started in 2000, concentrated on building a family of vehicles with off-the-shelf technology. The SBCT innovations laid the foundation for the FCS acquisition strategy. The Army's Future Force family of systems concept is complicated by a holistic environment requiring extensive system of systems integration

and advanced, network-capable systems and subsystems. The PEO Ground Combat Systems (PEO GCS) is responsible for total acquisition and logistics actions for the FCS. The PEO must produce, field and sustain the full complement of equipment and networks envisioned for the Future Force Units of Action (UA) and Units of Employment (UE). Current Force units that will eventually convert to UA and UE configurations should apply the same family of systems logic as to modernize. Figure 1 re-enforces the diverse acquisition strategies and structures supporting each force.

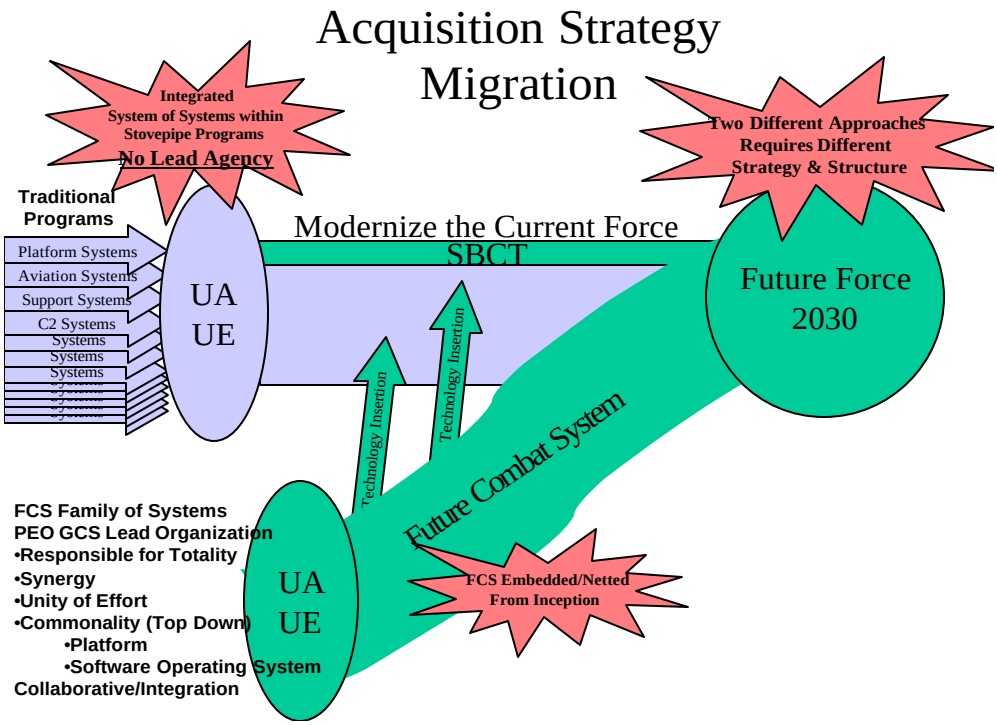

FIGURE 1. ACQUISITION STRATEGY MIGRATION

Current Army jargon uses “system of systems” and, more recently, a “family of systems” terminology. Figure 2 helps define the terms. The boxes (Joint Tactical Radio System, Improved Data Modem) integrated onto the Apache Attack Helicopter (AAH) are subsystems of the larger platform system which, when combined, form a system of

systems.[3] Taking this a step further, the Apache itself is a system which operates within multiple C4ISR interoperability environments such as the digitized force in 4th Infantry Division, the Blue Force Tracking Enhanced Information System (EIS), and, eventually, in the Future Force. Each environment includes an aggregate number of system of systems to form a larger family of systems.[4]

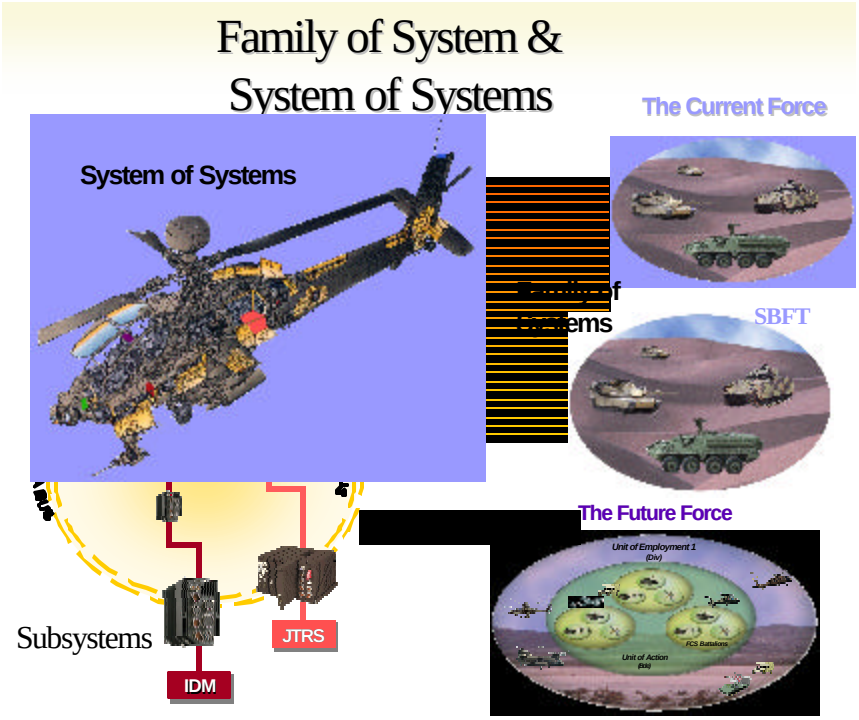

FIGURE 2. FAMILY OF SYSTEMS & SYSTEM OF SYSTEMS

PLATFORM/SYSTEM CENTRIC (TRADITIONAL) APPROACH

From the 1970s through mid 1985 the Army was transforming doctrine, organization, materiel, and training. As it is now, materiel was a major component of the transformation with the development and procurement of Abrams, the Bradley Fighting Vehicle, the Apache and Blackhawk helicopters, the Multiple Launch Rocket System, the Stinger surface to air

missile and the Patriot air defense system. The requirements generation process, known as the Capabilities Requirement Based System (CBRS), was designed to counter the “cold war” threat and was based on known Soviet doctrine and equipment. This threat changed slowly and was somewhat predictable.[5] Training and Doctrine Command (TRADOC) combat arms centers developed the requirements. These requirements drove weapons platforms to be superior against all known threats in lethality and survivability. The requirements process and a known threat capability led to limited interaction between the combat arms centers and the acquisition community. The combat arms centers generated the requirement and threw them “over the wall” to the materiel developer. The Abrams was built to destroy and survive against the best armored vehicles and anti-tank missiles.[6]

The technology S-curve demonstrates that each platform/technology will reach a point when it has achieved the limits of its underlying physical principles (Figure 3).[7] The S-curve demonstrates the evolution of change occurring on the left curve until the growth is constrained by the physical and technological capacity. At that point, any further performance gains are limited until there is a breakthrough in technology allowing for a shift to a new S-curve. This phenomenon is referred to as disruptive technology and is necessary for revolutionary change. In the 1980s, advanced technology allowed the Army to achieve a breakthrough and shift to a new S-curve, for example, the movement from the M60 to the M1 tank (Figure 4). Shifting to a new vehicle with advanced technology provided greater potential for growth and expansion into the future. As the M60 tank capabilities moved to the upper right part of the curve, its ability to increase performance became harder without a significant increase in funding and time. The new technologies in the M1 tank allowed the shift to a new S-curve. The Abrams growth potential increased its capability, but now the Army is faced with the same dilemma as with the M60 in the 1980s.

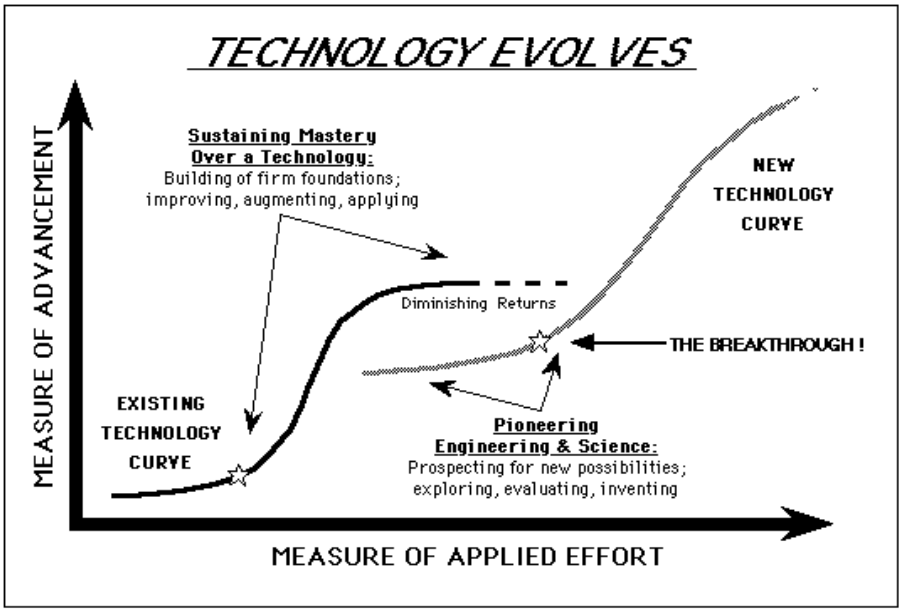

FIGURE 3. TECHNOLOGY EVOLVES

S- Curve M60 to M1Tank

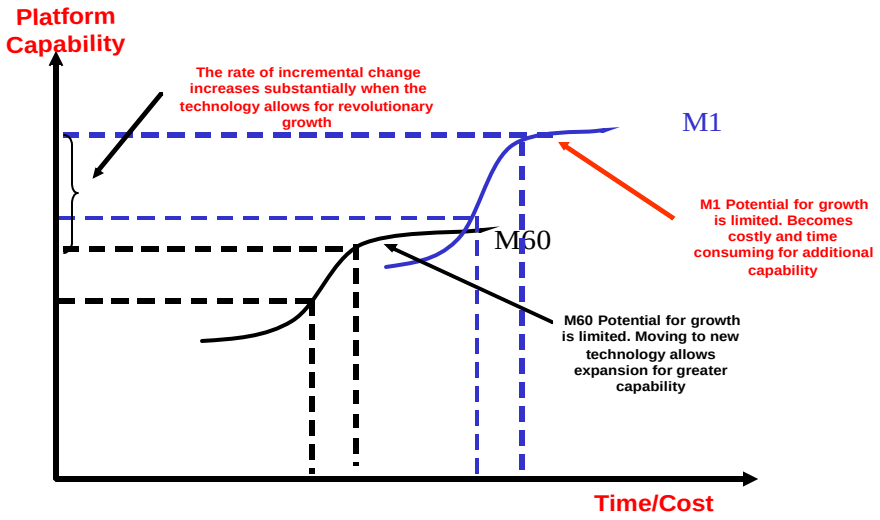

FIGURE 4. S-CURVE M60 TO M1 TANK

The traditional acquisition approach required submission of a Program Office Memorandum (POM) for each platform/system to fund development and production. The combat arms center supported and defended budgets based on known threats. The ability to identify and evaluate these threats proved easy enough through intelligence collection. Budget presentations to OSD and Congress were based on tangible evidence. The ability to defend weapons programs diminished in proportion to the decreasing Soviet threat, allowing OSD and Congress to divide and conquer Army program funding. They expertly forced combat arms centers and program managers to justify their systems versus other platforms. They were able to pick on individual platforms and systems without appearing to degrade the total force.

The traditional Program Manager awarded a contract to a specific corporation. The platforms were produced on threat requirements that drove structure and design. The operating systems were closed systems, based on 1980s technology. The corporations focused on platform capabilities disregarding future upgrade programs. The majority of program upgrades were in the form of lethality and survivability (bigger gun, improved armor and target acquisition). When the Force XXI Battle Command Brigade and Below (FBCB2) was introduced, the difficulty of integrating a software intense subsystem onto the platform became apparent. Stovepipe designed platforms did not efficiently integrate complex common software, nor have the flexibility to accommodate future changes/modifications. Initially, the FBCB2 system was an ad hoc system, not fully integrated into the platform.[8] The 4th ID became the test bed unit and provided double loop learning in the development phase.[9] This system included hardware and software that was initially intrusive and not user friendly. As the FBCB2 evolved, the PM focused on meeting requirements set by their combat arms center without looking horizontally and vertically for platform integration considerations.

Placement of FBCB2 onto PEO Aviation platform centric helicopters presented a greater challenge than the ground systems. The PEO formed a new organization called PM Aviation System (PM AS) to manage common “boxes” within their stovepipe platform. The

PM realized that they could build synergy, unity of effort, and efficiencies by building commonality within the platforms. Funding came from the separate platform lines and combined under the new PM to develop, produce and integrate common boxes onto the various platforms. If funding remained in the platform line, commonality would have been more difficult to achieve. Each platform would develop their own distinct configuration without centralized guidance. The aviation community reconfigured the FBCB2 software into FBCB2-Air, allowing platform system of systems integration. FBCB2-Air decreased the processing capacity and power, and allowed the use of existing internal hardware to run the system. The corresponding airframe manufacturer (i.e. Boeing, Sikorsky, Bell-Textron) performed the initial integration of the software. The Army funded five integration efforts for each platform manufacturer at the expense of PM AS. When FBCB2-Air was installed, the platforms remained stovepiped with closed operating systems. FBCB2 remains an immature system requiring spiral development and causing rippling effects down to FBCB2-Air and platform systems. FBCB2 changes occur every 18 to 24 months causing increased cost and integration time per platform.

Joint Tactical Radio System (JTRS) is going through similar integration challenges and rippling effects to the platform centric strategy. PEO Aviation is developing an initiative to build a common operating system to support JTRS integration within the stovepipe platforms. The PEO has realized that their stovepipe platforms are not adaptable to the software complex systems that change every 18 to 24 months. They realize that they can not keep pace with costly commercial standards. JTRS box integration to the platform will require a major overhaul of the operating system software. Initially PM AS planned to provide each platform PM/builder with funds to upgrade their software as in the FBCB2 integration. This would require PM AS to pay five platform builders for JTRS integration onto their stovepipe systems. PM AS re-evaluated the strategy and, instead of parceling out the integration dollars to five platform programs, decided that building a common avionics module would be efficient and cost effective. The module allows the same protocols on all the platforms making integration much easier and providing flexibility to match commercial changes. This approach is still being studied but the decision must be made in FY04 or the opportunity window for integration with the JTRS system will be lost.

The traditional approach was stable and changed slowly allowing for orderly fielding schedules. The information age increased the cycle time required for upgrades due to the fast pace in technology advances in software and hardware. Army units are experiencing the issuance of 35 to 90 unsynchronized and non-integrated systems fielding or software drops for major systems in a single year.[10] The average time between technology changes was every 18 months. For example the Improved Data Modem (IDM) in the aviation platform went through 6 changes in 12 years.[11] The Army learned that they needed a fielding program to reduce the downtime caused by uncoordinated fielding of systems to units. The Army developed a system of systems management process to help synchronize platform and system fielding. This process is driven by the DA master priority list (DAMPL) and Army order of procedure (AOP) memoranda. It provides a window of opportunity for acquisition PEOs to conduct fielding of their products to the units. Unfortunately there is not one central authority for the overall responsibility and synchronization of the systems prior to the fielding. This causes conflicts with regards to a unit's time, resources and soldiers.

Due to the high rate of software upgrades, the Army initiated a software blocking group to monitor the changes and de-conflict programs to eliminate risk and the rippling effects to their systems. LTG Byrnes, Army Deputy Chief of Staff for Programs, stated "Under software blocking, the Army is making a commitment to divest itself of its traditional systems-centric approach to embrace a system of systems capability that supports each element of the Doctrine, Organization, Training, Leadership, and Materiel."[12] The software blocking program is trying to break the stovepipe structure in the acquisition community and foster better communications among the PMs. As stated above, units are identified for equipment fielding and upgrades in accordance with the DAMPL and AOP. A key driver to software changes and schedule is FBCB2, but this will shift to the FCS communication and battle command architectures in the future. Software blocking is a worthwhile initiative, but it is not problem free. As FBCB2 upgrades its software, the other systems must wait for software completion or some form of a beta software insertion with creditable maturity before the other systems start their development. If a system does not meet the unit set fielding schedule it is dropped from the block and waits for the next block, causing grave consequences when fielding a system of systems approach. Therefore, the platform will not

have the capability to operate effectively within the upgraded FBCB2 environment.[13] The process has not accomplished the first software block and keeps slipping it to later in the schedule.

FAMILY OF VEHICLES (STRYKER BRIGADE COMBAT TEAM (SBCT))

Former CSA General Shinseki's speech at AUSA in October 1999 challenged the Army to bring about a change the way it does business and start moving toward the 21st century. He stated that he wanted to decrease the armor weight by 50% to 70%. This initiated a change to program acquisition strategy, process and structure. The change in strategy was going from a platform/system centric philosophy to a family of vehicles. More importantly it brought changes to the way the acquisition culture functions, allowing the community to start setting the stage for a Future Combat Team. The Army had never before attempted, via a single acquisition, to contract for a full complement of vehicles and systems designed to provide enhanced warfighting capability. The Army had not purchased a ground combat vehicle or conducted a major ground combat acquisition since the early 1980s.[14] The family of vehicles approach supported the system of systems fielding process. It was based on providing everything the unit required in order for it to accomplish its mission. PEO GCS formed a new organization that included all the platforms under the leadership of one program manager.

When the concept was proposed it was based on the whole unit and not individual platforms or systems. Since the vehicles are light-skinned and not as survivable as their predecessors, they required a holistic approach to how they would fight. The holistic and family of vehicles approach changed the PM structure and responsibility. The acquisition strategy states "the PM is in a unique location organizationally and geographically to influence the totality of acquisition and logistics actions needed to produce, field and sustain the full complement of equipment envisioned for the BCT. The PM's responsibilities expand beyond the Stryker vehicle and into the full materiel and systems integration of the BCT of the force.[15] The centralized and totality responsibility for the family of systems clearly established the progression of how the Future Combat Systems program was forming.

The new philosophy of acquiring assets for a unit set allowed the Army to budget and plan more efficiently. The program was able to aggregate the total cost. The Army

presented OSD and Congress the total unit requirement and a fully funded program, including programs identified for termination to fund the SBCT program. Funding for the vehicles was placed under one line item under PM BCT allowing the PM greater flexibility. [16] This was a revolutionary change from when they were placed in different line items. As the program began, the PM could divert money from platforms that could not meet schedule to platforms that could wisely use the funding that year. Acceleration in one platform freed money in the latter years that could be spent on the platform that had to shift its schedule. The PM is currently having trouble with Congress with the consolidation of platforms in one line item budget. It is harder for Congress to micromanage funding if it is included in a total aggregate. Congress can not target individual line items as easily as before. Another budget initiative was that the bidders in the selection process to build the Stryker were told the amount of funding for the family of vehicles and had to bid to that funding. These figures were previously hidden from the bidders. Disclosure opened the dialogue necessary to get the best value on the investment.

Other major changes in the acquisition process were the teamwork and initiatives which PEOs, combat developers, industry, OSD and Congress took to meet the timeline set by the CSA. From the beginning of the process the combat developer and the PM worked hand in hand. This was vital to set up successful delivery of a product off-the-shelf and into the hands of the soldier. The combat developer set up a demonstration in the early requirements phase to grasp the capabilities of currently available vehicles. They wanted to ensure that their requirements were not beyond the capability of all known vehicles and still make the bids competitive. This was an eye opener for the combat developer. It focused a requirement generation process on current capabilities rather than concepts. They realized that all vehicles have pros and cons that helped identify potential modification and technology insertions which the selected platform required.[17] Upon completion of the demonstration, the combat developer wrote a requirements document which served as a vital tool in the selection of the final winner. Additionally, the combat developers were part of the source selection board, an unprecedented step. This allowed them to understand the acquisition selection process and have ownership in the selection of the vehicle.

The Working Integrated Product Teams (WIPT) and Overarching Integration Product

Teams (OIPT) set the conditions for approval of the SBCT program. The schedule timeline required a close relationship in the early stages of the compressed acquisition cycle. Within a four month time period the program went through a budget drill with the President Budget Decision, an omnibus, the Army System Acquisition Review Council (ASARC) and the Defense Acquisition Board (DAB) prior to the Request for Proposals (RFP). The coordinated effort between the management from Stryker Program Office, Department of Army (DA) and Office of Secretary of Defense (OSD) resolved most of the issues before going in front of the ASARC and DAB. These close working relationships prevented many of the key players from skewing the process, the traditional method of doing business. Many traditional timelines were circumvented which could have been disabling if followed. Often the PM had to go over OIPT principals to get a staunch traditionalist on board to support the timeline objectives. Key OSD leaders wanted this project to succeed and pushed their teams and shortened their processes in support of the family of vehicles strategy. They began changing their culture as well. One of the major outcomes was the ability of the PM to buy half of the programs production quantity (50%) within his low rate initial production (LRIP). Regulation normally limits this to 10%. This progression allowed the program office to award a contract within16 month (including 3 months for contract protest) after the announcement from CSA in Oct 1999. This process usually took 3-5 years under the traditional system.

The holistic and the family of vehicles approach allowed the Army to pursue a true Unit Set Fielding system of systems for the first time. General Byrnes, Army Deputy Chief of Staff for Programs, stated the following:

> Collectively, these processes focus on providing the greatest capability, not necessarily the largest number of individual systems, by synchronizing fielding plans and de-conflicting demand on soldiers. Overall, this balanced approach of fielding systems of systems rather than simply individual pieces of equipment means that the Army will get far greater value for its investment throughout the transformation process.[18]

The internal component of bringing this about was the off-the-shelf purchasing of materiel. The high risk of using advanced technology was not a determining factor, therefore the synchronization was easier to coordinate. During the final synchronization stage the combat

developer and the materiel developer made trade-offs in scheduling and performance to get all of the materiel to come together prior to fielding. The ones that could not make the initial fielding were placed on planned product improvements (P3I) program. Upgrades and P3I programs have the same problems that were mentioned with the traditional platform centric approach. The integration of changing complex software intensive systems (FBCB2 and JTRS) would be costly and time consuming. The SBCT units would soon find themselves in a constant battle to upgrade their systems as FCS spirals their technology into the Current Force. In the near future, inserting technology into the Current Force UA and UE will require close coordination and synchronization to build efficiencies in schedule and cost.

FAMILY OF SYSTEMS APPROACH TO THE FUTURE COMBAT SYSTEM

Unlike the off-the-shelf family of vehicles approach, the FCS will invest and use advanced technology in the research and development phase. The Future Combat Systems Program was formed under PEO GCS after successful Milestone B approval in June 2003. General Byrnes stated that the "Transformation to the Objective Force (now Future Force) is conceptually about a revolution in the way the Army fights. It requires a science and technology (S&T) effort that focuses on yielding a knowledge based operational capability, while increasing strategic deployability and operational and tactical mobility."[19] The force will rely on more complex integrated systems providing near real time information.

Applying the technology S-curve to the FCS program indicates that a shift occurs from the old to a new platform. However, the overall concept is more than an individual platform or system of systems. It is the family of systems as shown in Figure 5. The Army's transformation occurs in materiel when a system of systems is truly netted into a family of systems that is considered to be "disruptive."[20]

Family of Systems S-Curve

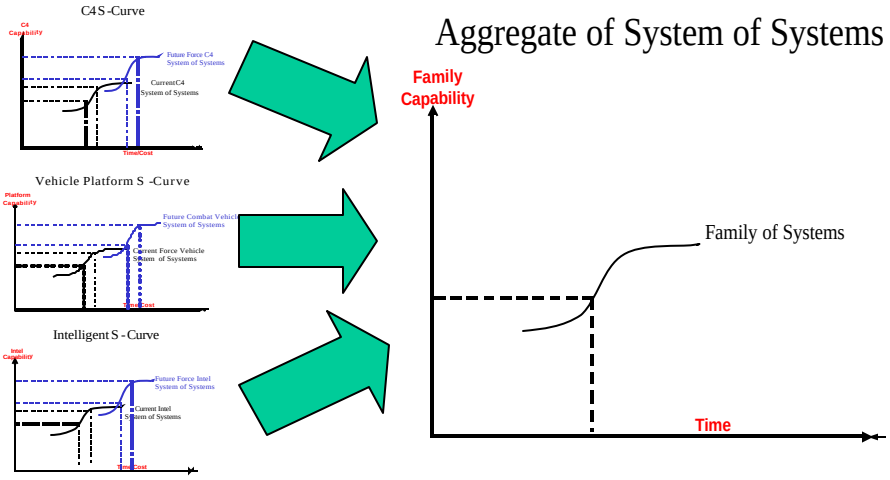

FIGURE 5. FAMILY OF SYSTEMS S-CURVE

PEO GCS has initiated a new approach to manage the task of synchronizing the family of systems. The PM FCS awarded a contract to Boeing and Science Applications International Corporation (SAIC) as the Lead Systems Integrator (LSI). This approach to management is different than the traditional procurement of a platform or system. The LSI's major responsibility is to provide the vision and system of systems architecture oversight.[21] This approach requires close working relations between the LSI, PEO and combat developer. LSI is not a government office but is considered an extension of the government, quasi governmental. Boeing defines this new role as "functions much like a general contractor in overseeing and ensuring all program objectives are met - and continuously soliciting the best 'experts' in each program area around the world."[22] This forces them to think outside than traditional government/industry relations. The way the LSI and the government view each other will have to change. This new relationship focuses on trust and open dialogue to provide the best value for the government. Although the LSI is Boeing

and SAIC, they are required to remain impartial when they decide the correct course of action. In fact, it is likely that the LSI must, and has, awarded contracts to corporate competitors who are now partners in the FCS development effort.

The LSI management is looking at a collaborative environment for developing a family of systems. This concept relies on computer and internet technology to share the information necessary to create the environment to incorporate emerging technology. Collaboration will ease the integration burden of software sharing and identify compatibility problems early. Sharing information and building common software within the system of systems will enhance the adaptability and flexibility to insert technology. To have a truly netted system, it must start with all players submitting and understanding each others requirements. There will be numerous small decentralized teams, constantly inputting requirements and changes to a centralized integrator, the LSI. This is a true partnership that requires full and open communication. The overall organization is decentralized with teams working their own systems but requires a centralized integration effort to make the force a netted system.

The major risk in this program is the advanced Science and Technology (S&T) maturity required for program success. The GAO has conducted extensive studies on managing technology development and the implications on weapons systems when they are inserted too early in the program. The strategy and process of the FCS program must possess the knowledge and ability to determine the maturity of technology required to build stability in the development and production phases. The GAO report states that two conditions are necessary prior to sending an S&T program to the next step.

> First, placing responsibility for maturing the technology to S&T managers and provide them with the flexibility to make decisions. Second, have good matrices to determine the maturity of the technology handoff decision, coupled with the program manager having the authority to refuse new technology that does not meet product requirements.[23]

A key role of the LSI and the program office is to assess the level of maturity of the technology. They must look at user requirements and determine what capabilities are necessary to achieve those requirements. Current changes to the Defense Acquisition

Management framework in DoD 5000.2, May 2003, stress this point by defining two distinct phases in Concept and Technology Development. The concept refinement phase allows the combat developer to refine the initial requirements and the program manager to develop a Technology Development Strategy (TDS). The second phase of technology development is the identification of the technologies to be integrated into the full system. The PM must assess the technology maturity level, affordability and time available. Technology maturity is based on the Technology Readiness Level (TRL) as shown in Figure 6.[24] The LSI and program office have identified and assessed 31 critical FCS technology areas that, if not available, would result in significant degradation of UA effectiveness.[25] TRLs 1 through 6 are considered high risk and 7 through 9 low risk for product launch. The 31 critical technologies were categorized into the following TRLs:

- 7 were at TRL 6
- 10 were between TRL 5 and 6
- 10 were at TRL 5
- 4 were at less than TRL 5

An incremental evolution acquisition approach was implemented to get the product to the field quickly and ease the problem of advancing immature technology too soon.[26] If the technology is not mature enough, it will be pushed into a later increment. As the technology matures it will be included in the next increment. Each increment is time phased and uses a modular open system to facilitate technology insertion (Figure 6). Decisions to push technology into another increment could affect the unit integrity. The concept of a holistic combat unit is vital. Waiting for an immature technology could hinder the overall unit capability or cause the program schedule to slip. All capabilities are important. Failure to achieve 100% capability increases unit risk. Full capability requires close team relationships with all concerned to make joint decisions and accept total ownership by all concerned.

Another important aspect to this new approach is the modularity and common operating system design. Figure 8 represents System of Systems Common Operating Environment (SoSCOE), a conceptual picture to be implemented in the FCS.[27] SoSCOE provides an open application interface and isolates Battle Command Applications from the ad hoc network. As was the case with FBCB2, there were substantial changes occurring

throughout the development phase. The architecture for FCS will also go through substantial changes that will require continuous software integration onto platforms and other systems. FCS is developing

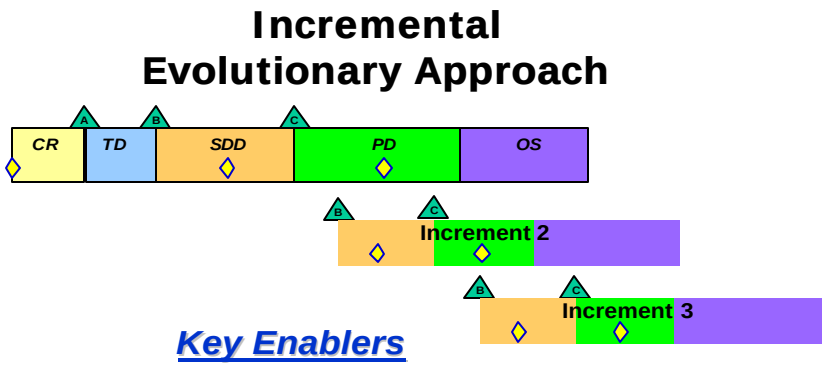

FIGURE 6. INCREMENTAL EVOLUTIONARY APPROACH

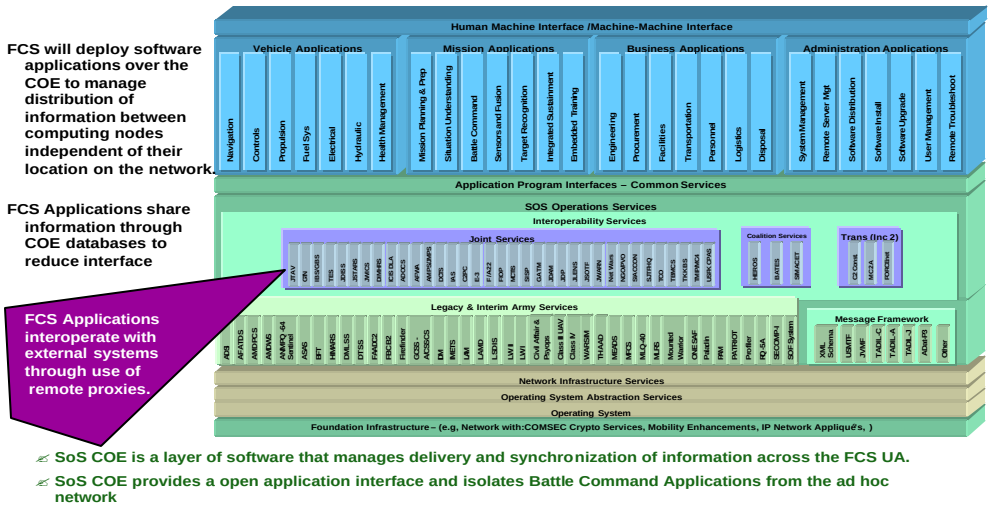

FIGURE 7. SYSTEM OF SYSTEMS COMMON OPERATING ENVIRONMENT

the majority of the platforms and systems from the "cradle." They design and plan interfaces embedded from the start versus after the fact to accommodate evolving software designs. The software designers from one system must be part of the initial development of another platform and/or system design. They must design, develop, adopt and share a common software package in the system and platform to ease the burden of changing capabilities in one system, causing rippling effects to others. Each platform needs the capabilities inherent to the design with the ability to accept changes without extensive integration redesign and testing requirements. This concept will allow the platform to have the flexibility and adaptability to change every 18 to 24 months with software changes. Overall, the acquisition cycle time decreases significantly and becomes closer to the commercial marketplace.[28] A common operating system will allow fewer interface integration challenges and decrease cost and complexity.

The FCS program will budget as a UA and UE. As with the SBCT, budgeting at the unit level allows the Army budgeters to understand the cost per unit and budget accordingly.

This allows the program to have the flexibility to make trade-offs among the individual systems.[29] Due to the immaturity of some systems, the PEO has the ability to shift and re-prioritize money from one program to another or from one increment to another. Overall, the program office has greater flexibility to manage program funding most efficiently and effectively. The incremental evolutionary approach supports the full funding required from OSD and Congress. In April 2003, DoD specified that each increment must follow milestone decisions and program approval.[30] This helps determine the funding required for each increment. If the Army can not afford everything, incremental trade-offs must be made. Those trade-offs are made in coordination with the user community. The concept of holistic combat effort is vital. Waiting for a capability due to funding constraints could hinder the overall unit. The holistic unit and incremental evolutionary approach builds synergy and unity of effort among the family of systems which is easier to defend programs and budgets.

COMPARE AND CONTRAST ANALYSIS

An interdependency relationship evolved between government and industry as the system of systems became more complex. In the 80's and 90's the relationship between industry and government was cooperative in nature but underlying their appearance, they were benign adversaries. General Shinseki challenged the Acquisition Corps to adopt innovative strategies and streamline the process to produce and field the Stryker Brigade family of vehicles. This forced a renewed teaming partnership between government and industry. It formed corporate teams that were adversaries in competition to collectively join to meet the challenges. It required close working relationships that challenged all government agencies to take the initiative to change from business as usual and streamline the acquisition process. The WIPT and OIPT successfully streamlined the acquisition process by awarding a full and open competitive contract in 16 months. The FCS recognized the benefits and success and formed highly effective WIPT and OIPTs. One lesson learned from the traditional and family of vehicles approaches was how to synchronize and integrate complex software systems. The FCS formed the LSI which will require cultural change in both organizations. The LSI will continuously seek other industry participation through initiatives such as the collaborative environment, spiral, and incremental development.

A major difference between the three approaches is the maturity of technology and

flexibility to integrate and insert technology in spiral development. The traditional approach was built with stovepipe operating systems in a closed environment. Integrating FBCB2, a complex software system, was costly and time consuming. The Army implemented unit set fielding and a software blocking program to ease some of the burden caused by constant software changes and integration. Both initiatives have problems due to a lack of responsible organization, coordination, and synchronization. The SBCT unit set fielding at Fort Lewis proved successful. The role of the PEO GCS to coordinate and synchronize fielding of the unit and the use off-the-shelf technology improved the dependability of product schedules and kept fielding timelines intact. Army leadership recognized the importance of having a central organization to coordinate and synchronize all of the activities in the acquisition community. Many government agencies did not fall under the normal PEO GCS structure or funding guidance, but the implied authority gave them the ability to put pressure on non-performing agencies to meet their responsibilities and schedules.

In the future, FCS will spiral technology into BCT and will experience the same integration and insertion problems as the platform centric approach. Traditional platforms and systems do not lend themselves to technology insertions and spiral development. To modernize the current inventory, the Army should focus on the subsystem level. Technology development and upgrades in subsystems requires the larger system or platform to have the flexibility and adaptability to accept change.[31] The BCT family of vehicles will ease integration problems due to common operating system versus multiple vehicle configurations. PEO Aviation started two initiatives to build commonality to ease software spiral integration into their stovepipe platforms. They formed a new organization to explore, develop, and integrate common boxes across the platforms and built a common operating software system hosted in the platform.

The family of systems approach expands on this concept building commonality and common operating systems that facilitate spiral development and incremental procurement. As seen with the FBCB2, immaturity and high risk caused great consternation with spiral development and with continuous rippling effects on the platforms. Thirty-one FCS technologies were identified as “must have” or the unit would face significant degradation. Of the thirty-one, twenty-four are considered “more risk than recommended by best practices

or DoD guidance."[32] The FCS program will have major challenges managing immature technology. The common operating system and the continuous collaboration among all of the team members will build the flexibility and adaptability necessary for 18 to 24 month software and hardware changes to meet industry standards.

The PMs' relationship with the combat developer changed as the primary threat changed from the Soviets to the unknown. The acquisition community built the traditional platform to defeat and survive the Soviet threat, requiring little interaction between the combat and materiel developers. The SBCT family of vehicles forced closer ties between the two organizations. They tried to ensure the use of as many off-the-shelf products as was practicable. The combat developer was included in all phases from source selection and trade-off prioritization through the production phase. The family of systems approach takes many of the SBCT initiatives and re-positions key leaders to further develop close relationships. They work together to identify the critical capabilities required for initial production. The changes to DoD 5000.2 in the requirement development phase are encouraging and emphasize close dialogue between combat and materiel developers.

Budgeting for the platform centric approach was based on total Army requirements, known threat, stovepipe organizations and platforms and did not consider unit set fielding until FBCB2 integration. The PEO budgets were inefficient and inflexible. The acquisition community successfully convinced the Army, OSD and Congress that the best way to budget was to fund based on unit set fielding and incremental evolution concept. Great benefits were derived from this new method of budgeting. The Army focused for the first time on programs contributing to the holistic unit capability versus the parochial combat arms centers requirements generation process. Supporting and defending the holistic capability as a unit countered the argument of separating programs that were easier to cut and kill for funding considerations. The family of vehicles was placed under one budget line providing the program office flexibility. The FCS adopted the new budget process based on unit set fielding, spiral development and incremental acquisition. The budget is focused on a community rather than an individual, so a problem in one element did not necessarily spell disaster for the community. It also allowed the program office managers greater flexibility to make trade-offs across traditional program lines for best values. It allowed the office to shift

immature technology to the next increment providing for graceful degradation when necessary. [33]

OBSERVATIONS

The PEO must split its focus on the Current and Future Force divergent programs. Both Current and Future Forces are going to become a netted complex system of systems forming UA and UE organizations. They will structure their organizations for collaborative relationships with a multitude of members, however, they require different acquisition strategies and relationships to achieve their end state. The Current Force programs where produced with 1980/90s technology and will have spiraled advanced technology passed to them from FCS for integration into their systems. Future Force systems are “born” with embedded advanced technology into a family of systems. They both compete for resources (funding, personnel, leadership) and will create conflicts in management within PEO GCS.

Having two Program Executive Offices - Future Combat System (PEO FCS) and Current Combat System (PEO CCS) - will facilitate the synergism, unity of effort and efficiencies required for revolutionary change in Current and Future Forces. The formation of two PEOs, CCS and FCS, creates an environment for each organization to assume full responsibility for the totality of acquisition and logistic actions as they go through the acquisition process for UA and UE. Under the current structure, an organization concentrating on both forces could undermine the concept of a totality strategy and prohibit the continued cultural changes required for different avenues to achieve success. Changing underlying structures can produce different patterns of behavior. [34] The Current Force and the Future Force use different acquisition strategies and organizational structures while in the same organization. The organizational cultures are divergent and need to focus on different philosophies. The new strategy for a LSI requires a significant change in culture in the government/industry relationship. Separating the traditional programs allows FCS leadership to sever themselves from the old ways and foster this new relationship. Application of the Competing Values Framework (CVF) [35] shows the two organizations in competing quadrants. The focus of these organizations could develop conflict in values. The Future Force “Open System Model” values insight, innovation, and adaptation. The Current Force “Internal Process Model” values stability, control and continuity. [36] Current

Force is trying to make do with today's systems effectively and efficiently in a controlled environment. The two avenues of approach must de-conflict opposing views and allow key leaders to focus on their domain. PEO GCS leadership has to have a "split personality" to effectively manage the two divergent programs.

The use of two PEO's supports the new CSA's immediate focus, bringing future technology to the Current Force. The new PEO for Current Force can better determine and identify gaps, flaws and additional cost as new acquisition systems are inserted from internal or external organizations into the UA and UE environment. Divergent programs cause inefficiencies when the systems are integrated into the system of systems without good coordination and synchronization for independent system designs (rippling effects). The Army has already experienced working issues with complex digital units. They have attempted to resolve issues one system at a time by resolving very specific concerns as they arise as offered by Colonel Christopher J. Toomey.

> Three challenges occur: (1) this is an extremely costly and bottom-up approach that teeters between modification and experiment;(2) spill over problems are rampant due to the lack of a consistent, holistic approach from system of systems perspectives; and (3) it requires the unit to cease operations and training to integrate the change, which often requires substantial training time in an already crowded schedule.[37]

Giving the PEO for the Current Force responsibility for the totality of acquisition and logistic actions as programs insert technology will enhance control and authority that is lacking today. The Army has a multitude of traditional programs moving in different directions to achieve the "Current to Future Force." Assigning responsibility for alignment of the programs, a commonality of direction emerges and a synergy develops "as a light of a laser rather than the incoherent and scattered light of a light bulb."[38]

The Army has initiated unit set fielding and software blocking for synchronization with limited success. The new role of the PEO for Current Force would assume responsibility for unit set fielding. The PEO's greatest challenge is integrating technology onto stovepipe platforms in a coordinated effort. The PEO evaluation of FCS spiraling technology before integration is vital to determine the maturity level, cost and timing to insert technology. It may not be effective to integrate new technology with traditional programs due to time and fiscal

realities. If integration is going to occur, a centralized PEO structure can facilitate choosing the best course of action for synergism and efficiencies. There are benefits to building synergy among the programs as seen with PEO Aviation. They formed a new organization to build commonality among their stovepipe platforms. Expanding the PEO Aviation Common Avionics Module throughout air and ground platforms is a quick way to build synergy and efficiency reducing integration cost and time.

Budget competition between traditional programs and FCS programs are bound to emerge under one organization. Separating the PEO would make it harder to transfer funds from either Current or Future Force program lines allowing better management of funds for each PEO. The PEOs are able to concentrate and justify internal adjustments/trade-offs based on holistic capabilities and unit set fielding schedules. Establishing a PEO organization for each force allows them to concentrate and improve the unit set fielding based on past and future acquisition strategies. For the Current Force, having a central authority will bring stability and reliability to both software blocking and unit set fielding. The PEO would have a better grasp of program status and testing to identify and resolve the last minute surprises. Separating the PEO supports the total package fielding (TPF) process described in AR 700-142, the intent of which is to reduce the logistics burden on the gaining MACOM and their subordinate user support organizations.[39]

The new focused PEO FCS concentrates on building a coherent-complex netted family of systems for the Future Force. Taking risks and inserting innovation are essential cultural components for the success of PEO FCS. An aspect of corporate culture in the Silicon Valley is the importance of encouraging trial and error, not being afraid of failure. They found that an increased number of failures bred more highly successful ventures. PEO FCS must have the same opportunity to take risk and accept failure in the hope to gain “leap ahead” technology. An article in Transformational Defense stated that “Overall, innovative organizations and individuals have not fared well within the Army in recent years. Senior leaders have failed to protect, nurture, and publicly reward them and then it becomes easier for existing units to either ignore them or to argue that they are not effective.”[40] Separating the programs from the Current Force traditional ways will foster cultural change from the

past. The Army cannot afford to have this organization bogged down in the bureaucracy of the traditional system.

Having two organizations will help temper the need to accelerate technology too fast. Maturity requirements are different for each approach and maintaining them within one organization could force one of them into accept the technology too soon. The family of systems is based on the “born” embedded/netted complex systems. Pushing systems into the first increment could encourage subsystems to short cut the process. The vital collaboration between organizations could break down causing uncoordinated software designs that reduce ease of integration. With the significant number of systems that are considered too immature for inclusion into FCS development phase, there is the potential to build closed stovepipe systems. Potential problems also arise when immature technology is pushed into the traditional platforms, causing rippling effects that the Army can not afford. It is critical to monitor the maturity and only accept the technology ready for production according to the current phase of each program. Experimentation and testing considerations are different with possible divergent results. The organization must conduct trial and error which accommodates complex system surprises.[41] This calls for experimentation, a difficult task for any large established organization.[42] Separate organizations will ease the conflicting results and determine the technology to pursue and eliminate the others that could derail their programs.

CONCLUSION:

PEO GCS has the responsibility of managing programs associated with the Current Force and Future Force. Each force requires diverse acquisition strategies. They both compete for resources (funding, personnel, leadership) creating conflicts in management within PEO GCS. They require a structure that is responsible for the totality of acquisition and logistics actions that build synergism and unity of effort based on their acquisition strategy. When the three approaches were compared and contrasted, the research showed a significant change of philosophy in the FCS family of systems approach. The analysis demonstrates that the SBCT was a necessary and essential step for the acquisition community to create the evolutionary change required to set conditions and start cultural changes to provide a strong foundation for the FCS strategy. The research indicates that the

acquisition community focused on transformation of the Future Force but left the Current Force with minimal guidance and lack of total ownership. The acquisition community must reorganize and develop a different strategy to succeed in achieving the “Current to Future Force.” Current Force units are being formed as UA and UE and should apply the same logic of family of systems to modernize. Creating a separate PEO for each force is the best solution to bringing synergy and unity of effort to both forces.

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ENDNOTES

[1] Department of the Army, *2020: The Army in 2020*, White Paper (Washington , D.C.: Objective Force Task Force, 21 November 2003), 1

[2] Chief of Staff of the Army General Peter J. Schoomaker, "Relevant and Ready," Army Knowledge Online, www.army.mil/leaders/csa/presentations/RelevantAndReady.htm ; Internet; accessed 22 October 2003, 3

[3] In 1996, Admiral William A. Owens (Vice Chairman, Joint Chiefs of Staff) stated "the system of systems combines a vast assemblage of intelligence collection, surveillance, and reconnaissance (ISR); advanced command, control, computers, and intelligence processing (C4I); and precision-weapon systems result in a whole with capabilities much greater than the sum of the parts." Richard O. Hundley, "*Past Revolutions: Future Transformations*," (National Defense Research Institute RAND, 1999), 78

[4] General Joseph L. Yakovac, Jr., "Striving for Battlefield Omniscience," *Military Training Technology*, Volume 8 (Issue 3, 2003): 17

[5] National Research Council, Board on Army Science and Technology, *STAR 21 : Strategic Technologyies for the Army of the Twenty-First Century* (National Acadamy Press, 1992), 234

[6] Frederick W. Kagan, "A Dangerous Transformation, "*Opinion Journal Article* Dec 2003 available from http://209.157.64.200/focus/f-news/1020473/posts ; Internet; accessed Dec 2003.

[7] Mare G. Millis, "Breakthrough Technology: Warp Drive, When," available from http://www.grc.nasa.gov; Internet; accessed 11 Jan 2004.

[8] Christopher J. Toomey, "Army Digitization: Making it Ready for Prime Time," *Parameters* 18 (Winter 2003-04): 46

[9] There are four basic steps in the action theory learning process: (1) discovery of espoused and theory-in-use, (2) invention of new meanings, (3) production of new actions, and (4) generalization of results. Double loop learning involves applying each of these steps to itself. In double loop learning, assumptions underlying current views are questioned and hypotheses about behavior tested publicly. The end result of double loop learning should be increased effectiveness in decision-making and better acceptance of failures and mistakes. Greg Kearsley, "Double Loop Learning: Overview," available from http://tip.psychology.org/argyris.html. Internet accessed Dec 2003.

[10] Department of the Army, *How the Army Runs: A Seniors Leader Reference Handbook* , (U.S Army War College and Carlisle Barracks, 2003-2004), 235.

[11] LTC (R) Mr. Corwyn Tiede, Former PM Aviation Mission Equipment, telephone interviewed by author, 19 Dec 2003 and 10 Jan 2004.

[12] LTG Kevin Byrnes, “Objective Forces Systems: Fielding Capabilities for Tomorrow’s Requirements,” *Army AL&L Magazine* (Nov-Dec 2001): 4

[13] LTC (R) Mr. Corwyn Tiede, Former PM Aviation Mission Equipment, telephone interviewed by author, 19 Dec 2003 and 10 Jan 2004.

[14] BG Donald F. Schenk and George J. Mitchell, “Acquisition Lesson Learned – The Interim Brigade Combat Team & Interim Armored Vehicle,” (Center for Army Lesson Learned, Fort Leavenworth Kansas, 2001), 1.

[15] Colonel Donald F. Schenk, “Acquisition Strategy Report: Interim Armored Vehicle” (U.S. Army Tank -automotive Command, 17 March 2000), 24.

[16] Mike Viggato, Business Manager Brigade Combat Team, telephone interviewed by author, 12 and 16 Dec 2003.

[17] Colonel Edward J. Filiberti, Colonel James R. Oman, and Colonel James H. Thomas, “The Army Transformation: A Case Study,” (Carlisle Barracks: U.S. Army War College, 12 October 2001), 4.

[18] LTG Kevin Byrnes, “Objective Forces Systems: Fielding Capabilities for Tomorrow’s Requirements,” *Army AL&T Magazine* (Nov-Dec 2001): 5.

[19] Lieutenant General Kevin P. Byrnes, “Objective Force Systems: Fielding Capabilities for Tomorrows Requirements,” *Army AL&T Magazine* (Nov-Dec 2001): 6.

[20] General Joseph L. Yakovac, Jr., “Striving for Battlefield Omniscience, ”*Military Training Technology* Volume 8 (Issue 3, 2003): 17.

[21] General Joseph Yakovac, Jr. and Colonel William R. Johnson, ”The Lead System Integrator: A Transformational Management Approach for the Objective Force,” *Army AL&T* (March-April 2003): 4.

[22] Boeing Corporation, “Future Combat System: Lead System Integrator,” Available from http://www.boeing.com/ids/ids-back/index.html; Internet; accessed 11 November 2003.

[23] General Accounting Office, Better Management of Technology Development Can Improve Weapon System Outcomes: Report to Congressional Requesters (Washington D.C.: U.S. General Accounting Office, July 1999), 34.

[24] Technology Readiness Levels (TRLs) —“that can assess the maturity level of technology as well as the risk that maturity poses if the technology is included in a product development. The tool associates different TRLs with different levels of demonstrated performance, ranging from paper studies to proven performance on the intended product. The value of using the tool is that it can presage the likely consequences of incorporating a technology at a given level of maturity into a product development, enabling decision makers

to make informed choices." General Accounting Office, *Better Management of Technology Development Can Improve Weapon System Outcomes: Report to Congressional Requesters* (Washington D.C.: U.S. General Accounting Office, July 1999), 23-25.

[25] General Accounting Office, Future Combat System: *Issues Facing the Army's Future Combat Systems Program: Report to Congressional Requesters* (Washington D.C.: U.S. General Accounting Office, 13 Aug 2003), 25

[26] Department of Defense 5000.2, *Operation of Defense Acquisition*, (Washington D.C.: U.S. Department of Defense, 12 May 2003) 3.3.2.2

[27] Program Office Future Combat System briefing to General Byrnes, "Network Review" 2 Oct 2003

[28] Author K. Cebrowski, "New Rules for a New Era," 21 October; available from http://www.oft.osd.mil/library/library_files/trends_163_transformation_trends_21_october_issue.pdf; Internet; accessed 12 December 2003.

[29] General Accounting Office, *Future Combat System: Issues Facing the Army's Future Combat Systems Program* (Washington D.C.: U.S. General Accounting Office, 13 Aug 2003), 2

[30] General Accounting Office, *DOD Revised Policy Emphasizes Best Practices, but More Controls Are Needed: Report to Senate and House Committees on Armed Services* (Washington D.C.: U.S. General Accounting Office, November 2003), 11

[31] National Research Council, Board on Army Science and Technology, *STAR 21 : Strategic Technologyies for the Army of the Twenty-First Century* (National Acadamy Press, 1992), 208.

[32] General Accounting Office, *Future Combat System: Issues Facing the Army's Future Combat Systems Program* (Washington D.C.: U.S. General Accounting Office, 13 Aug 2003), 25.

[33] Ibid., 35

[34] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday Publishing Co., 1990), 234-243

[35] James G. Hunt and Robert L. Phillips, "Leadership in Battle and Garrison: A Framework for Understanding the Differences and Preparing for Both." (In U.S. War College Selected Readings Academic Year 2003: Course 1 Selected Readings. Carlisle Barracks, Pennsylvania: U.S. Army War College), 392.

[36] Ibid., 391-409.

[37]Christopher J. Toomey, “Army Digitization: Making it Ready for Prime Time,” *Parameters* 18 (Winter 2003-04), 46.

[38] Peter M. Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency Doubleday Publishing Co., 1990), 234.

[39] Department of the Army, *How the Army Runs: A Seniors Leader Reference Handbook* (U.S Army War College and Carlisle Barracks, 2003-2004), 233.

[40] Chris C. Demchak and Patrick D. Allen, “Technology and Complexity: The Modern Military’s Capacity for Change,” *Strategic Studies Institute Transforming Defense* (December 2001), 118.

[41] Ibid., 108

[42] David Jablonsky, “Army Transformation: A Tale of Two Doctrines,” *Strategic Studies Institute Transforming Defense* (December 2001), 49.

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